REMARKS

Claims 1, 4-8, 15, 21 and 22 have been amended and new Claims 23-44 have been added. Claims 1-44 remain pending in this application.

I. Rejection of Claims 1-14 and 22 under Section 102

Claims 1-14 and 22 stand rejected under Section 102 as being anticipated by U.S. Patent No. 5,978,972, issued to Stewart et al.

Claim 1

Referring first to Claim 1, the office action states that Stewart teaches a device for monitoring the acceleration of a body part by a plurality of sensing devices which are positioned orthogonal to the outer surface of the body part to detect acceleration. The office action also states that the sensing devices generate a signal which is sent to a processing device to determine the magnitude and direction of an impact to the body part.

However, Stewart teaches a device and method which is completely different than Applicants' claimed invention, as amended. Stewart discloses a system that employs a fundamentally different methodology for determining the direction of an impact to a body part. First, in similar fashion to Applicants' invention, Stewart employs an array of accelerometers which generate signals which are later processed to determine the direction and magnitude of the impact to the body part.

However, the orientation of the accelerometers in Stewart is completely different than in Applicants' invention. The heart of Stewart's invention is to arrange each of the accelerometers precisely orthogonal *to each other.* Stewart requires that each of its accelerometers be positioned to sense acceleration in directions which are orthogonal to each other. See Col. 6, lines 30-33. Also, see Examiner remarks in the Office Action of December 15, 2003, page 9, lines 8-10. In Claim 1 of Stewart, it is specifically stated that the first and second acceleration monitoring directions are "orthogonal to each

other" and that the third acceleration monitoring direction is "orthogonal to a plane defined by said first and second acceleration-monitoring directions". Since it is known that Stewart's accelerometers are positioned to be orthogonal to each other, the appropriate calculations and data processing can be made to determine impact direction and magnitude.

Stewart frequently carries out the precise orthogonality of its accelerometers by using very expensive tri-axial accelerometers which are permanently set to sense acceleration in three known directions which are orthogonal to each other. Alternatively, less expensive single axis accelerometers can be used in Stewart, however, they must be fixedly secured in a rigid helmet and in known orthogonal locations relative to one another. In Stewart, the orthogonal positioning of the accelerometers to each other is critical. In Col. 4, lines 45-59, Stewart states:

> "The HAT is designed as a standard component of otherwise conventional sporting gear, in particular the helmet. It includes at least three orthogonally-placed accelerometers and means to record the output therefrom in real time. As many as three sets of three orthogonally-placed accelerometers can be used to measure uniquely the translational, angular and normal components of acceleration of the head. In one embodiment, three orthogonally-placed accelerometers are sufficient to provide some translational and angular acceleration information regarding the head by integration."

Thus, Stewart requires that it's accelerometers be positioned precisely orthogonal to each other. The required orthogonality of Stewart sensors are illustrated in the attached illustrative drawing figures which are Fig. 2 of Applicants' invention is shown on the left next to Fig. 4C of the Stewart '972 patent on the right. Stewart positions accelerometers that sense acceleration in, three directions, labeled "1", "2" and "3". Direction 1 is in the *z* direction, while direction 2 is in the *y* direction and direction 3 is in the *x* direction (coming out of the page). Directions 1, 2 and 3 are each positioned and required to be orthogonal to each other as shown. Thus, for Stewart's invention to work

properly to make accurately calculations, Accelerometer sensing Directions 1, 2 and 3 must be precisely positioned orthogonal to each other.

This is in direct contrast to Applicants' invention. The claims herein have been amended to state that the accelerometers are specifically not arranged orthogonal to each other. An example of Applicants' non-orthogonally positioned accelerometers are shown in the left side drawing on the attached illustrations. Fig. 2 of Applicants' invention shows Directions 1, 2 and 3 of the accelerometers radiating out 120 degrees apart from one another on substantially the same plane. In Applicants' invention, the directions of sensing are clearly not orthogonal to each other like they are in Stewart. The present invention solves the aforementioned problems in the prior art by employing less expensive accelerometers which need not be positioned orthogonal to each other. In fact, as described in the specification, Applicants' accelerometers are intentionally positioned non-orthogonal to each other.

Since Stewart fails to show accelerometers which are not orthogonal to each other, Claim 1 is not anticipated by the prior art and is, therefore, allowable.

Claim 2

Claim 2 depends from now allowable Claim 1. Therefore, Applicants submit that Claim 2 is now also allowable over the cited prior art.

Claim 3

Claim 3 depends from now allowable Claim 1. Therefore, Applicants submit that Claim 3 is now also allowable over the cited prior art.

Claim 4

Claim 4 depends from now allowable Claim 1. Therefore, Applicants submit that Claim 4 is now also allowable over the cited prior art.

Claims 5-7

As stated above, Stewart teaches accelerometers that are positioned precisely orthogonal to each other. Claims 5-7 have been amended to specify that the accelerometers are not positioned in such a fashion.

Also, Claims 5-7 depend from now allowable Claim 4 which is dependent from now allowable Claim 1. Therefore, Applicants submit that Claims 5-7 are now also allowable over the cited prior art.

Claim 8

Claim 8 requires that the accelerometers sense acceleration in directions that are all in the same plane but not being orthogonal to each other. Stewart only teaches accelerometers that are precisely orthogonal to each other. Thus, Stewart fails to teach the invention claimed in Claim 8.

Therefore, Stewart fails to teach the limitations of Claim 8. Also, Claim 8 depends from now allowable Claim 1. Therefore, Applicants submit that Claim 8 is now also allowable over the cited prior art.

Claim 9-14

Claims 9-14 depend, either directly or indirectly, from now allowable Claim 1. Therefore, Applicants submit that Claims 9-14 are now also allowable over the cited prior art.

Claim 22

The office action states that the method of Claim 22 is shown in Stewart at Col. 14, lines 27-42. The office action states that Stewart's first, second and third acceleration measurement directions are orthogonal to the outer surface of the body part. However, Stewart measures only in directions which are precisely orthogonal to each other. Applicants' invention requires that the accelerometers *not* be positioned orthogonal to each other. Stewart fails to teach such non-orthogonality of the accelerometers.

Therefore, Stewart fails to teach Applicants' claimed method in Claim 22. As a result, Applicants submit that Claim 22 is now allowable over the prior art.

In view of the foregoing, Stewart et al. '972 fails to anticipate Claims 1-14 and 22 under Section 102(b). Applicants submit that Claims 1-14 and 22, as amended, are now allowable over the cited prior art.

II. **Rejection of Claims 15-21 under Section 103(a)**

Claims 15-21 stand rejected under Section 103 as being unpatentable over Stewart et al. in view of Vogt.

The office action states that Stewart discloses a method for determining the magnitude and direction of an impact to a body part having a geometric shape where the accelerometers are not only proximate to the outer surface of the body part but also sense acceleration in directions which are orthogonal to the surface of the body part. It is also stated that Stewart does not disclose a method that uses a hit profile function from a geometric shape of the body part and to process the data obtaining by comparing the hit results to acceleration data and best fit matching to determine best fit hit results to finally determine the magnitude and direction of the impact to the body part. However, this is purportedly taught by Vogt.

As stated above, the accelerometers of Stewart must be positioned orthogonal to each other because Stewart requires that precise orthogonality to make its directional calculations. In contrast, as shown on the attached illustration, the accelerometers in the present invention are not positioned orthogonal to each other. All that is needed is that the accelerometers be positioned on a known geometric shape, such as the ellipse (matching close to the ellipsoid head of Fig. 2). In Applicants' invention, there is no need for the accelerometers to be positioned orthogonal to *each other*. In fact, if the accelerometers are <u>not</u> positioned orthogonal to each other, then they can be positioned with more flexibility (See Fig. 2, for example).

Stewart's accelerometers are not positioned relative to a given geometric shape. All that is needed in Stewart is that the accelerometers *must* be orthogonal to each other. The variable of relative positioning of the accelerometers in Stewart must be completely removed. This is accomplished by positioning the accelerometers in a fixed and known relative position to one another which is orthogonality. However, such a requirement places restrictions on the positioning of the accelerometers.

Due to the way Applicants calculate acceleration direction, such orthogonality need not be maintained when the accelerometers are placed about a known geometric shape. As set forth in the specification, it is this known geometric shape that is employed in the calculation of acceleration direction and magnitude not the positioning of the accelerometers in a fixed orthogonal relationship to each other.

Stewart fails to teach non-orthogonal accelerometers and Vogt fails to teach a hit profile function of the geometric shape of a body part. Since, Stewart requires that the accelerometers be orthogonal to each other, the arrangement of them about a body part and the shape associated therewith (e.g. circle or ellipse) is completely irrelevant. In other words, Stewart does not care about the shape of the body part because it already is positioning its accelerometers in a known position relative to each other (i.e. orthogonal to one another). Vogt does not even mention geometric shapes or shapes of body parts. Thus, there is absolutely no motivation to combine these references because Stewart is completely devoid of any teaching for the desire to calculate or consider in any way a geometric shape, for estimating the shape of a body part or otherwise. Thus, Stewart would have no reason to consider a geometric shape as suggested in the office action. As a result, Stewart and Vogt cannot be combined under Section 103.

Therefore, Stewart fails to teach Applicants' invention as to the positioning of the accelerometers. Vogt fails to disclose the hit profile function as required by the claims.

Even assuming Stewart and Vogt are combinable under Section 103, they still fail to teach Applicants' claimed invention, as amended. It is submitted that Claims 15-21 are allowable over the combination of Stewart and Vogt.

III. New Claims

New Claims 23-44 have been added. These claims specifically require that the accelerometers are not orthogonal to each other. As a result, a new an unique device and method for monitoring acceleration is shown and claimed. For the reasons stated above, new Claims 23-44 are also allowable over Stewart alone or in combination with Vogt.

IV. Conclusion

Applicants submit that Claims 1-22, as amended, and new Claims 23-44 are allowable over the cited prior art. In view of the above, Applicants submit that pending Claims 1-44 are now in condition for allowance. Reconsideration of the Rejections and Objections are requested. Allowance of Claims 1-44 at an early date is solicited.

If an extension of time is required for timely submission of this response, Applicant hereby petitions for an appropriate extension of time and the Office is authorized to charge Deposit Account 02-0900 for the appropriate additional fees in connection with the filing of this response.

The Examiner is invited to telephone the undersigned should any questions arise.

Respectfully submitted,

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David R. Josephs
Registration No. 34,632
BARLOW, JOSEPHS & HOLMES, LTD.
101 Dyer Street, 5th Floor
Providence, RI 02903
Tel: 401-273-4446
Fax: 401-273-4447
e-mail: *drj@barjos.com*